Dual busbar loop connection

Overview

A Laminated Busbar Design for Multiple IGBT Modules ParallelingBased on independent IGBT modules' paralleling, a laminated busbar is designed in this paper.

Key Takeaways

A dual busbar loop connection integrates positive and negative buses in a single block to optimize current distribution, reduce loop inductance, and simplify assembly in high-power systems.

Overview

A dual busbar loop connection typically combines both the positive and negative conductors into a single busbar assembly, allowing for a compact and efficient power distribution system. This configuration is widely used in power electronics, marine, and industrial applications where multiple circuits need to be connected while maintaining low impedance and high current capacity.

Key Advantages

Reduced Loop Inductance: By placing positive and negative conductors close together, the magnetic flux generated by the current in each conductor partially cancels, minimizing stray inductance and improving switching performance in converters. Improved Current Sharing: Laminated or parallel busbar designs ensure that current is evenly distributed among multiple modules, reducing stress on individual devices and enhancing reliability. Compact Design: Combining both buses into a single block reduces space requirements and simplifies wiring, which is particularly beneficial in high-density power electronics.

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Mechanical and Electrical Reliability: Properly designed dual busbars maintain low resistance, withstand environmental stress, and provide robust mechanical connections.

Connection Methods

Bolted Joints: Overlapping busbars with bolts and washers ensures mechanical strength and electrical continuity. Careful torque and washer sizing help maintain uniform contact pressure. Soldering or Spot Welding: These methods can be used for permanent connections, though they increase manufacturing complexity and cost.

Laminated Busbars: Multiple layers of conductors separated by insulation can be used to connect high-current modules in parallel, improving current sharing and reducing loop inductance.

Applications

Power Converters: Dual busbar loops are critical in IGBT or SiC module-based converters, where low inductance and balanced current sharing are essential for high switching speeds and efficiency. Marine and Automotive Systems: Products like the Blue Sea DualBus 100A combine multiple circuits in a single block, simplifying installation and maintenance.

High-

Power Distribution: Industrial systems benefit from dual busbars for compact, reliable, and low-impedance connections between multiple loads and power sources.

Design Considerations

Symmetry: DC and AC connections should be symmetrically positioned relative to modules and capacitors to ensure even current distribution. Stray Inductance and Capacitance: Sharp bends or corners should be minimized to reduce voltage drops and heat generation. Thermal Management: High-current busbars may require cooling or thermal plates to maintain performance and prevent overheating.

Simulation and Testing: Finite element analysis and double-pulse tests are often used to verify current sharing, inductance, and thermal performance before deployment. In summary, a dual busbar loop connection is an effective solution for high-current systems, providing low inductance, balanced current distribution, and compact assembly, while requiring careful design of mechanical, electrical, and thermal parameters to ensure reliability and efficiency.

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Article Content

A Laminated Busbar Design for Multiple IGBT Modules Paralleling

Based on independent IGBT modules'' paralleling, a laminated busbar is designed in this paper. It could improve the current sharing characteristics for various topologies such as half-bridge parallel, H

A Comprehensive Guide to Jointing Busbars: Which

This process, called “jointing,” may be needed to create a longer busbar from shorter, more manageable pieces; or to create a T-shaped tap-off connection

A Laminated Busbar Design for Multiple IGBT Modules Paralleling

Following a number of design principles and the circuit topology used in practical applications, a laminated busbar that can improve the current sharing characteristics of the system is

Bus Bar Theory of Operation

Traditional bus bar current measurement techniques use closed loop current modules to accurately measure and control current. These modules usually require a large magnetic core that encloses the

Busbar Design for High-Power SiC Converters

Busbars are critical components that connect high-current and high-voltage subcomponents in high-power converters. This paper reviews the latest busbar design

Busbar Section

The Busbar System is based on a two-bar-per-phase system, both horizontal and vertical, eliminating time-consuming drilling and bending of copper bars. The

User connection configurations | National Grid

The double circuit, double busbar configuration provides an efficient and reliable point of connection for a variety of users, and accommodates for multiple drivers,

Copper Busbar Connections Explained: Torque Control, Contact

Learn why full overlap is not required for copper busbar connections. This guide explains how proper busbar torque specification, contact resistance, and international standards ensure safe,

Types of Busbars & Schemes – Explained with

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This arrangement uses two busbars and a bus coupler to connect isolating switches and circuit breakers to the busbar. It allows for load transfer

Busbar Systems

Isolator Q1 connects busbar 1, Q2 connects busbar 2 of the corresponding field to circuit breaker Q3. For the outgoing field, the connection to the outgoing feeders is established by means of circuit

Circuit configurations (single line diagrams) for HV and

The most common circuit configurations of high and medium-voltage switchgear installations are shown in the form of single line diagrams next

Single vs Double Busbar Schemes: Design & Comparison

Single busbar and double busbar schemes are the core substation bus topology choices behind reliability, maintainability, and switching flexibility. Engineers use them to decide how feeders,

Terminal Connection Busbars

Terminal Busbars Whether you need to connect a few high amperage cables, or many low amperage connections in a fast-paced production environment, VTE

Electrical Bus System and Electrical Substation Layout

Various electrical bus system schemes exist, and selecting the right one depends on system voltage, position of substation in electrical power system, required flexibility, and cost. The

How to Design Busbar Systems for Substations

A well-designed busbar system ensures minimal energy losses, improved reliability, and enhanced safety. This guide provides a detailed technical description, calculations, design

Six common bus configurations in substations up to 345 kV

Comparison of bus configurations This technical article explains six most common bus configurations used for distribution, transmission, or switching

Busbars, internal routing, supports and expansion loops

Flexibles connecting the two ancillary lines to be bent from test configuration to tunnel one (see Arnaud''s slide demonstrating cutting and ergonomics feasibility)

Types of Busbar Arrangements in Grid Stations and Substations

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The arrangement and connection of incoming and outgoing feeders in grid stations and substations and the number of busbars have a significant influence on the supply reliability of the

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